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ABSTRACT

The development of a successful short-range forecasting model for predicting enrollment in a university intensive English course began with examination of the characteristics (nationality, enrollment patterns, persistence) of both course participants and no-shows; the resulting figures revealed consistent patterns for country of origin and for former versus new students. Show-up rates were derived from these patterns, and several prediction models were applied to registration data for several semesters. This analysis revealed further patterns in walk-in registrations and in the differential timing of registration according to the student's country of origin. A database was developed to record, at the time of application, the information found to be relevant in these analyses, including name, country of origin, geographic area, semester applied for, date of application, new- or former-student status, and current location (in the United States or abroad). The results for each semester are incorporated into the next semester's prediction formula. Other impact factors, such as a country's changing educational or political policy and economic situation, changes in U.S. immigration regulations, and changes in university policy are also considered. These considerations are quantified when possible and integrated into the forecasting model. An initial forecast is made ten weeks before the semester begins and is revised weekly until classes begin. An appended handout section presents supporting data including graphs, forecasting formulas, and an enrollment forecast table for the past five semesters. (MSE)

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FORECASTING ENROLLMENT IN INTENSIVE ENGLISH LANGUAGE PROGRAMS

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Enrollment in intensive English language programs in the United States has fluctuated in the last seven years, as documented by Open Doors 1984/85. According to their survey figures, in the three years between Fall 1978 and Fall 1981, the IELP institutions responding to the survey showed an increase of 37% in the number of foreign students enrolled. This rise was followed by a 21% decline in enrollment within the next three years (see Graph A). This represents a net gain of only 8% during this period. Meanwhile, the number of programs serving this population increased by 116%, from 163 to 352. Annual enrollment at the LCC reflects these trends also (see Graph B).

Forecasting enrollment was one of the problems addressed at a conference designed by IIE. Proceedings from the conference, which was held in April of 1984, were published in the book, Foreign Student Flows, edited by Elinor Barber. In one of the background papers written for the conference, Inkeles and Sirowy state that "Social prediction is a chancy endeavor. Generally, almost as soon as the prediction is made it is proven wrong. They go on to say that " What most wreaks havoc in this kind of predictive enterprise are the political and economic fortunes and misfortunes of nations." For example, few could have predicted the dramatic surge of students from the OPEC nations or the subsequent cutbacks by a handful of these countries. However, given these limitations, there was still a consensus among the administrators attending the conference that it was necessary to continue to try "to understand the conditions that affect student flows and therewith facilitate effective planning, instead of

ill-founded panic or euphoria".

At the Language & Culture Center, we came to this same conclusion nearly three years ago, after experiencing a year of consistently lower enrollment. We felt that it would greatly help in planning for our employment needs if we could develop a short range forecasting model that would enable us to predict enrollment to within plus or minus twelve students for an upcoming semester. In the summer of 1983, we began looking into the problem.

We started this project by examining the available data from the previous four semesters to see if we could identify any consistent patterns. We had the names of the students who had enrolled each semester and the countries they were from and knew whether or not they were new or former students. We had less reliable data on the students who had applied but had not shown up (no shows). We assumed that the number enrolled and the number of no shows could be added to give the number of applications. This figure was then used to compute a show-up rate, the percentage of applicants who actually enrolled or "showed up". The resulting figures revealed a fairly consistent show-up rate for the population as a whole over the four semester period from 65% to 71%- a range of only 6 points. Show-up rates were then computed for sub-groups, such as new and former students and students from different geographical areas. There were distinct differences in these rates for the various groups. For example, the former students had a much higher show-up rate than the new students and the Latin Americans had a higher rate than the

Middle Easterners (84% as compared with 60%). We also computed individual show-up rates for the fifteen most common countries and then computed a group show-up rate for the remaining population.

For the first few semesters we used three methods to compute a prediction range: geographical area, 15 most common countries, and overall. We applied the show-up rates for these groups to the applications to arrive at the predicted number of students. We learned several useful things that first year:

1. The walkins, students who register without having previously applied, were a significant factor and had to be figured into the forecasting formula. They make up approximately 20% of our population.

2. There was not a big difference in the predictions provided by the three methods.

3. We found that there were certain identifiable patterns in the geographical area distribution over time. For instance, our population tended to be heavily Middle Eastern and Asian six weeks before registration. As registration approached, the applications from Latin Americans picked up. This meant that the population we were using to predict six weeks ahead of time was not the same population we would have right before registration. This population fluidity meant that the prediction

utilizing the geographical area distribution might be unreliable when the predictions were made one to six weeks before registration. On the other hand, we knew that it was essential to take the population distribution into consideration as we had already experienced a major population shift which had adversely affected our enrollment. Up until the spring of '84, Latin Americans had been our dominant population, averaging 45 to 50% of our students, while Middle Easterners had made up only 20%. That spring, however, these two groups switched places. The Middle Easterners made up 40% of our student population and the Latin Americans fell to 25%. This trend has continued, with slight flucuations, through the current semester. This population change is important because of the different show-up rates for these two groups. As you will notice in the LCC Enrollment History Table on page two of the handout, in Fall '83 when the population was still predominately Latin American, the show-up rate was 60%. In the spring, when the population shifted to predominately Middle Eastern, the show-up rate fell to 43%. This represented a drop of 17% in our show-up rate. Faced with these conflicting factors, we devised the following plan, which would use the information we had gained from both of these predictors:

a. the overall show-up rate would be used in the prediction formula.
b. weekly population distribution comparisons would be made and, based on the results, the prediction would be adjusted.

4. Finally, we learned that a good system of data collection was essential to insure accurate figures on which to base forecasts.

We designed an application data base to track the parameters that we had identified as relevant to forecasting enrollment. At the time the application fee is paid, the following data is recorded: identification number, name, country of origin, geographical area, semester applying for, date of application, and previous enrollment status, i.e., new or former student. We also keep track of how many students are already in the U.S. This information is entered into our student data base and a program is run weekly. The program gives the following information:

1. frequency count by country
2. breakdown by geographical area
3. breakdown by student type, i.e. new or former student
4. count of the number of students currently in the U.S.

The number of applications is plotted on our application count graph each week (Graph C on page two of your handout). These figures are used to compute the average weekly gain in the number of applications and this figure is used in our forecast. This graph enables us to make easy visual comparisons of this semester's performance with previous semesters' and thereby be alert to changes.

The enrollment statistics are recorded after registration each semester

and the results are incorporated into the forecasting formula for the next semester. The Enrollment History Table (page two of the handout) lists statistics for Fall '83 through Spring '86. The average show-up rate is computed by dividing the total number of students who enrolled, excluding walkins, by the total number who applied. The walkin rate is an average of the number of walkins during this same period.

The forecasting formulas are as follows:

TAA = CA + (TIME * AVE APP)
FORECAST = WI + (SU * TAA)

TAA = total anticipated number of applications
CA = current number of applications
TIME = number of weeks remaining until registration
AVE APP = average number of applications received each week
WI = anticipated number of walkins (computed by averaging the number of walkins during the past semesters)
SU = average show-up rate during the past semesters (computed by dividing the number of students who enroll, excluding walkins, by the total number who apply)

There is also an example of this forecast on page three of your handout. This forecast was made four weeks prior to our Fall '85 registration. At that time we had 232 applications and we anticipated we would receive twelve more each week, giving us a total of 280 applications by registration. This figure was multiplied by the average show-up rate (53%) and the product was then added to the average number of walkins

(26) to arrive at a prediction of 174 students.

TAA = CA + (TIME * AVE APP)
TAA = 232 + (4 WEEKS * 12)
TAA = 280

FORECAST = WI + (SU * TAA)
FORECAST = 26 + (.53 * 280)
FORECAST = 174

In conjunction with the forecast made using this formula, other factors that affect enrollment, which are termed impact factors, are taken into consideration. As we discussed earlier, the population characteristics, i.e. population distribution by geographical area and the number of new and former students, are examined to see if they remain consistent with those of the population on which the forecasting formulas are based. Any policy changes that might affect enrollment, such as the requirement by the People's Republic of China that their students have guaranteed acceptance into the university, are assessed. Outside factors, such as the devaluation of the Mexican peso and the drop in the price of oil, are taken into consideration. The possible impact of these factors is assessed, quantified where possible, and then modifications to the forecast are made. For example, last summer the head of the Immigration and Naturalization Service for our district ruled that we could no longer

accept students who were in the country on tourist visas (B2s). Using our data base, we found that over the past fifteen semesters students with B2 visas made up 12% of our population. This information gave us a way to quantify the impact of this new ruling. By careful screening, we knew we would eliminate some of the students with B2s from our application count and that a few others would be able to get their visas changed. We therefore estimated a loss of half of these students due to the new ruling and adjusted our fall forecast down by 6%. This spring semester we had an internal policy change: former students were no longer required to put a $100 deposit down when they pre-registered. Looking for a way to quantify the impact of this new policy, we compared the number of former students who pre-registered this semester to the number in the past and found that historically former students made up between 11 and 12% of the applications. This semester they made up 15%. We concluded that because the deposit was not required that most of the former students had already signed up and we would not have nearly as many former student walkins as we previously had. Last semester we had eighteen former student walkins. We estimated that we would get half as many this semester, so we adjusted the spring walkin prediction down by nine. When

we feel that adjustments to the forecast are necessary, we use the following adjusted forecast formula:

$$ADJUSTED\,FORECAST = FORECAST + (IMPACT\,FACTOR_1 + ...IMPACT\,FACTOR_n)$$

In the case of Fall '85, where we adjusted for the loss of the students with B2 visas, the final forecast was:

$$ADJUSTED\,FORECAST = 174 + (-.06 * 174)$$
$$ADJUSTED\,FORECAST = 164$$

The actual figures for Fall '85 were:

Total Applications	=	282
Walkins	=	28
Show-Up Rate	=	48%
Total Students	=	163

The initial forecast is made about ten weeks prior to registration. A forecast is then produced on a weekly basis using the most current figures. The reliability, therefore, increases the closer to registration the forecast is made. The Enrollment Forecasts Table on page four of your handout lists the forecasts made for the past five semesters. It shows the forecast at four weeks before registration, at the Friday before registration, the adjusted forecast, if any, the actual enrollment figure,

and, finally, the difference between the final forecast and the actual enrollment (margin). As you can see, we have met our goal of predicting within a class (plus or minus 12 students) four out of the five semesters. This forecasting model, although not perfect, has been a major improvement over our old method, intuition. There will always be unknowns and surprises, but a model such as this one provides us with a way to quantify the factors we are aware of and to use them to make educated judgments based on historical trends.

REFERENCES

Zikopoulos, Marianthi. 1985. *OPEN DOORS: 1984/85*, p.65. New York: Institute of International Education.

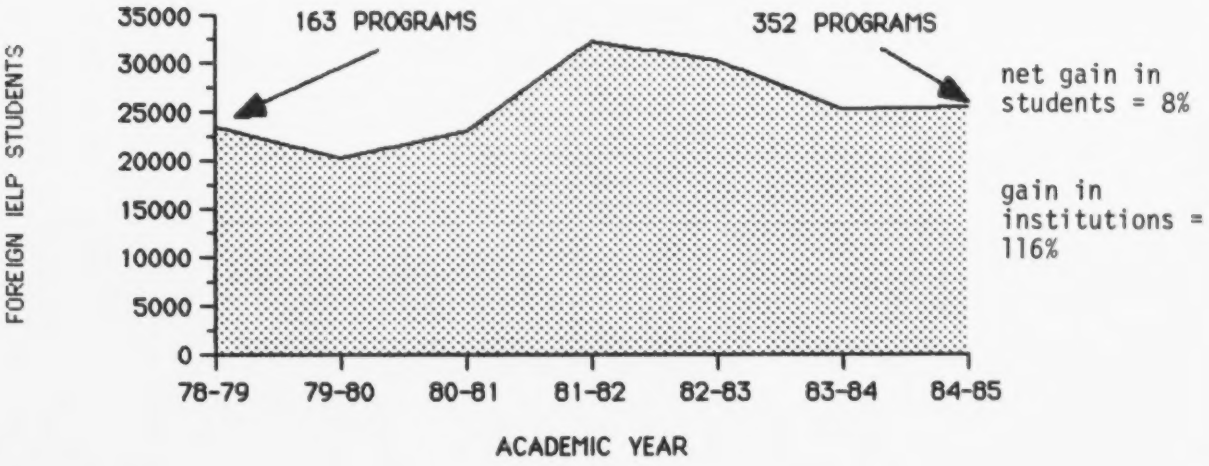
Sirowy, Larry and Alex Inkeles. 1985. University-Level Student Exchanges: The U.S. Role in Global Perspective. In Barber, Elinor G. (ed.), *Foreign Student Flows*, pp 30-85. New York: Institute of International Education.

FORECASTING ENROLLMENT IN INTENSIVE ENGLISH LANGUAGE PROGRAMS

Dr. Joseph O. Davidson
Linda Mead

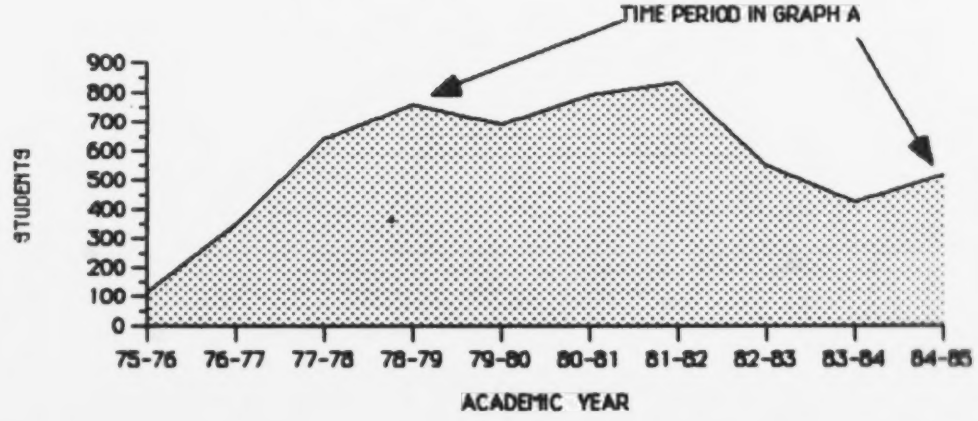
Handout

FOREIGN STUDENT ENROLLMENT AND
INTENSIVE ENGLISH LANGUAGE PROGRAMS REPORTING
FALL 1978/79 - 1984/85



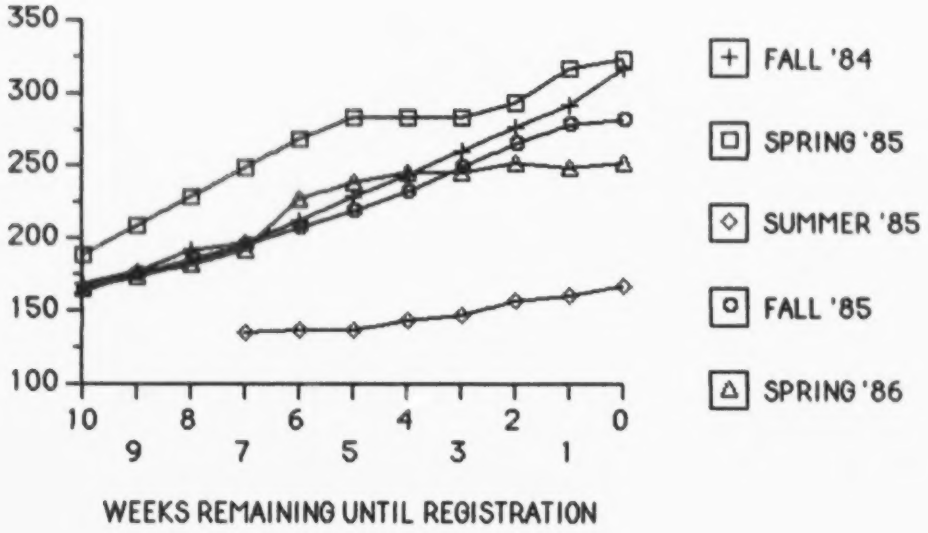
GRAPH A
(figures from OPEN DOORS 1984/85, p. 65. New York: Institute of International Education)

LCC ANNUAL ENROLLMENT
1975/76 - 1984/85



GRAPH B

LANGUAGE & CULTURE CENTER
APPLICATION COUNT



GRAPH C

LCC ENROLLMENT HISTORY

	APPLIED	ENROLLED (-walkins)	WALKINS	SHOW UP RATE
Fall '83	245	146	29	60%
Spring '84	251	107	37	43%
Summer '84	177	87	16	49%
Fall '84	316	168	20	53%
Spring '85	324	184	33	57%
Summer '85	166	87	22	52%
Fall '85	282	135	28	48%
Spring '86	251	112	14	45%
AVERAGE			25	51%

FORECASTING FORMULAS

TAA = CA + (TIME * AVE APP)
FORECAST = WI + (SU * TAA)

TAA = total anticipated number of applications
CA = current number of applications
TIME = number of weeks remaining until registration
AVE APP = average number of applications received each week
WI = anticipated number of walkins
(computed by averaging the number of walkins during the past semesters)
SU = average show up rate during the past semesters
(computed by dividing the number of students who enroll, excluding walkins, by the total number who apply)

FORECAST MADE FOUR WEEKS PRIOR TO FALL '85 REGISTRATION

TAA = CA + (TIME * AVE APP)
TAA = 232 + (4 WEEKS * 12)
TA = 280

FORECAST = WI + (SU * TAA)
FORECAST = 26 + (.53 * 280)
FORECAST = 174

ADJUSTED FORECAST = FORECAST + (IMPACT FACTOR +...IMPACT FACTOR)
ADJUSTED FORECAST = 174 + (-.06 * 174)
ADJUSTED FORECAST = 164

ACTUAL FIGURES FOR FALL '85

TOTAL APPLICATIONS = 282
WALKINS = 28
SHOW UP RATE = 48%
TOTAL STUDENTS ENROLLED = 163

ENROLLMENT FORECASTS

SEM	4 WEEK FORECAST	0 WEEK FORECAST	ADJUSTED FORECAST	ACTUAL ENRLLMNT	MARGIN
FALL '84	178	188		188	0
SPRING '85	203	194		217	-23
SUMMER '85	109	115		109	+6
FALL '85	174	175	164*	163	+1
SPRING '86	178	157	120**	126	-6

0 Week = the Friday before registration
Margin = the difference between the final forecast and the actual enrollment.

*Enrollment forecast adjusted for loss of students with B2 visas.

**Enrollment forecast adjusted for:

1. loss of students with B2 visas;
2. loss of former student walkins due to not requiring $100 deposit;
3. Middle Eastern population being higher than usual;
4. the falling price of crude oil;
5. the fact that many Koreans and PRC students were denied visas because they were admitted to a language school and not to a university.

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